CONCLUSION

IT is clearly shown, by the large number of examples which have been given, that only tho.se furnaces in which the circulation of the gases corresponds to the natural laws will work in a satisfactory manner; that is, the hot gases which are giving off heat and cooling should flow downward; the cold gas which is being heated should flow upward.

This simple truth was demonstrated at a very early date. The first form of reverberatory furnace, working with natural draft and furnished with a chimney, the so-called cupola, was invented in 1698. In Fig. 129 are reproduced some designs and a portion of the description taken from the *Manual of Metallurgy* of Schltiter, edition of 1738. This furnace, from which the waste gases pass off through the roof of the chamber, is the *ancestor* of the updraft furnace.

In the same work there is also described another German furnace, the inventor of which is unknown, but which was probably built about 1730, for the purification of copper from lead (Fig. 130). The disks of copper-lead are set on edge on a hearth shaped with a gutter or flue which slopes downward and drains into the waste-gas flue.

The flame or hot gas comes from a fire upon a grate of bricks. In filling the heating chamber, these gases surround the disks of metal, melting the lead, and descend between the disks and flow toward the port and the chimney. Into the same flue the melted lead flows, and-accumulates there, until it is drawn off, by means of the sloping of the bottom of the flue, into a small pit in front of the furnace (a fore hearth).

This shows that downdraft furnaces were invented a great many years ago. Many thousands of furnaces have been constructed since that time; nevertheless it is only in this late day that any clear conception has been arrived at concerning the mechanics of the circulation of the hot gases within

the furnace.